**Karmaveer Bhaurao Patil College, Vashi**
**Autonomous College**
**Affiliated to University of Mumbai**
**<u>Syllabus for Approval</u>**

| Sr. No. | Heading | Particulars |
|---------|---------|-------------|
| 1 | Title of Course | Computer Science |
| 2 | Eligibility for Admission | 200 Marks per Semester |
| 3 | Passing marks | 40 |
| 4 | Ordinances/Regulations (if any) | |
| 5 | No. of Semesters | Two |
| 6 | Level | U.G. |
| 7 | Pattern | Choice Based Credit System |
| 8 | Status | Revised |
| 9 | To be implemented from Academic year | 2022-23 |

**Rayat Shikshan Sanstha's**
**KARMAVEER BHAURAO PATIL COLLEGE,**
**VASHI.**
**NAVI MUMBAI**
**(AUTONOMOUS COLLEGE)**
Sector-15- A, Vashi, Navi Mumbai - 400 703

**Syllabus for S.Y.B.Sc. Computer Science**
**Program: B.Sc. Computer Science (Honors)**
**Course: S.Y.B.Sc. Computer Science**

**(Choice Based Credit System with effect from the**
**academic year 2022‑23)**

## Rayat Shikshan Sanstha's
### KARMAVEER BHAURAO PATIL COLLEGE, VASHI.
### NAVI MUMBAI (Autonomous)
### Department of Computer Science
### B. Sc. Computer Science

## ProgramOutcomes(POs)

**Learners Are able to–**

| PO-1 | Disciplinary Knowledge | Understand the basic concepts, fundamental principles, theoretical formulations and experimental findings and the scientific theories related to Physics, Chemistry, Mathematics, Microbiology, Computer Science, Biotechnology, Information Technology and its other fields related to the program. |
|------|------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| PO-2 | Communication Skills | Develop various communication skills such as reading, listening and speaking skills to express ideas and views clearly and effectively. |
| PO-3 | Critical Thinking | Propose novel ideas in explaining the scientific data, facts and figures related to science and technology. |
| PO-4 | Analytical Reasoning and Problem Solving | Hypothesize, analyze, formulate and interpret the data systematically and solve theoretical and numerical problems in the diverse areas of science and technology. |
| PO-5 | Sense of Inquiry | Curiously ask relevant questions for better understanding of fundamental concepts and principles, scientific theories and applications related to the study. |
| PO-6 | Use of Modern Tools | Operate modern tools, equipment, instruments and laboratory techniques to perform the experiments and write the programs in different languages (software). |
| PO-7 | Research Skills | Understand how to design, collect, analyze, interpret and evaluate information/data that is relevant to science and technology. |
| PO-8 | Application of Knowledge | Develop a scientific outlook and apply the knowledge with respect to the subject. |
| PO-9 | Ethical Awareness | Imbibe ethical, moral and social values and exercise it in day to day life. |
| PO-10 | Teamwork | Work collectively and participate to take initiative for various field-based situations related to science, technology and society at large. |
| PO-11 | Environment and Sustainability | Create social awareness about the environment and develop sustainability for betterment of the future. |
| PO- 12 | Lifelong Learning | Ability of self-driven to explore, learn and gain knowledge and new skills to improve the quality of life and sense of self-worth by paying attention to the ideas and goals throughout the life. |

# Preamble

The revised and restructured curriculum for the Three-year integrated course is systematically designed considering the current industry needs in terms of skills sets demanded under the new technological environment. The proposed curriculum is Choice Based Credit System, more contextual, industry friendly and suitable to cater the needs of society and nation in the present day context. The syllabus proposes to have three core subjects of Computer science, one Generic Elective course of Mathematics and one Skill Enhancement. All core subjects are proposed to have theory as well as practical tracks. Skill enhancement courses are as per industry requirement  that enables the students to enhance their practical skills.

Second year course covers developing capabilities to design formulations of computing models and its applications in diverse areas.

The course in Linux Operating System satisfies the need of understanding the structure and functioning of a system. Programming holds a key indispensable position in any curriculum of Computer Science. It is essential for the learners to know how to use object oriented paradigms(JAVA). The courses of Core java and Advance Java are in third semester and fourth semester respectively. There is also one dedicated course as a skill enhancement course in every semester.

The syllabus has a Database Systems course in previous semesters. The course in Database Management Systems as PL-SQL  is its continuation in the third and fourth semesters.
The course of Web Programming in third semester and continuing it in fourth semester. The course of Game Programming in third semester.

The course of Descriptive Statistics  in third semester and the course of Combinatorics & Graph Theory in fourth semester take the previous courses in Mathematics. Graph theory is rapidly moving into the mainstream mainly because of its applications in diverse fields which can further open new opportunities in the areas of genomics, communications networks and coding theory, algorithms and computations and operations research.

The course of Software Testing and the course of Dot Net Technologies with C# in the fourth semester. These courses build a strong foundation for programming and testing capabilities.

**Scheme of examination for Each Semester:**

**Continuous Internal Evaluation: 40 Marks** (Common Test-20 Marks & 20 Marks for- Mini Projects, Presentation, Online Course, Case Study, Assignment, Analysis In Statistics, Report Writing, Interviews, Paper Review, Surprise Test).

**Semester End Examination: 60 Marks will be as follows-**

| | | | |
|---|---|---|---|
| I. | Theory: The Semester End Examination for theory course work will be conducted as per the following scheme. | | |
| | Each theory paper shall be of two hours duration. | | |
| | All questions are compulsory and will have internal options. | | |
| | Q – I | From Unit – I (having internal options.) 15 M | |
| | Q – II | From Unit – II (having internal options.)15 M | |
| | Q – III | From Unit – III (having internal options.)15 M | |
| | Q – IV | Questions from all the THREE Units with equal weightage of marks allotted to each Unit. 15 M | |
| II. | Practical | The Semester End Examination for practical courses will be conducted as per the following scheme. | |
| **Sr. No.** | **Particulars of Semester End Practical Examination** | | **Marks** |
| 1 | Laboratory Work | | 40 |
| 2 | Journal | | 05 |
| 3 | Viva | | 05 |
| | **TOTAL** | | **50** |

**S.Y.B.Sc. Computer Science Syllabus**
**Credit Based System and Grading System**
**Academic year 2022-2023**
**SEMESTER - III**

| CODE | COURSE TYPE | SUBJECT | SCHEME OF INSTRUCTION (PERIOD PER WEEK) | | SCHEME OF EXAMINATION (MAX MARKS) | | | NO. OF CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | TH | LAB | CIA | SEE | TOTAL | |
| UGCSC301 | Core | OS & Linux | 4 | - | 40 | 60 | 100 | 4 |
| UGCSCP301 | Core Subject Practical | UGCSC301 Practical | - | 4 | | | 50 | 2 |
| UGCSC302 | Core | Computer Networks | 4 | - | 40 | 60 | 100 | 4 |
| UGCSCP302 | Core Subject Practical | UGCSC302 Practical | - | 4 | | | 50 | 2 |
| UGCSC303 | Core | Core Java | 4 | - | 40 | 60 | 100 | 4 |
| UGCSCP303 | Core Subject Practical | UGCSC303 Practical | - | 4 | | | 50 | 2 |
| UGCSSECP 304 | Skill Enhancement Elective - I Practical | UGCSSECP304 A Web Programming -I | - | 4 | | | 50 | 2 |
| | Skill Enhancement Elective - II Practical | UGCSSECP304 B PL/SQL- I | - | 4 | | | 50 | 2 |
| UGCSGE 305 | Generic Elective - I | UGCSGE305 A Descriptive Statistics - II | 4 | - | 40 | 60 | 100 | 4 |
| | Generic Elective - I Practical | UGCSGEP305 Practical | - | 4 | | | 50 | 2 |
| | Generic Elective - II | UGCSGE305 B Game Programming | 4 | - | 40 | 60 | 100 | 4 |
| | Generic Elective - II  Practical | UGCSGEP305 B Game Programming | - | 4 | | | 50 | 2 |
| | | | | | | TOTAL | 650 | 26 |

## SEMESTER - IV

| CODE | COURSE TYPE | SUBJECT | SCHEME OF INSTRUCTION (PERIOD PER WEEK) | | SCHEME OF EXAMINATION (MAX MARKS) | | | NO. OF CREDITS |
|---|---|---|---|---|---|---|---|---|
| | | | TH | LAB | CIA | SEE | TOTAL | |
| UGCSC401 | Core | Advanced Java | 4 | - | 40 | 60 | 100 | 4 |
| UGCSCP 401 | Core Subject Practical | UGCS401 Practical | - | 4 | | | 50 | 2 |
| UGCSC402 | Core | Software Engineering | 4 | - | 40 | 60 | 100 | 4 |
| UGCSCP 402 | Core Subject Practical | UGCS402 Practical | - | 4 | | | 50 | 2 |
| UGCSC403 | Core | Dot Net Technologies with C# | 4 | - | 40 | 60 | 100 | 4 |
| UGCSCP 403 | Core Subject Practical | UGCS403 Practical | - | 4 | | | 50 | 2 |
| UGCSSECP 404 | Skill Enhancement Elective - I   Or | UGCSSECP404 A Web Programming II Or | - | 4 | | | 50 | 2 |
| | Skill Enhancement Elective - II | UGCSSECP404 B PL/SQL  II | | 4 | | | | |
| UGCSGE405 | Generic Elective - I | UGCSGE 405A Android Developer Fundamentals | 4 | - | 40 | 60 | 100 | 4 |
| | Generic Elective - I Practical | UGCSGEP405  A Android Developer Fundamentals | - | 4 | | | 50 | 2 |
| | Generic Elective - II | UGCSGE405 B Combinatorics & Graph Theory | 4 | - | 40 | 60 | 100 | 4 |
| | Generic Elective - II Practical | UGCSGEP405 B Combinatorics & Graph Theory | - | 4 | | | 50 | 2 |
| | | | | | | TOTAL | 650 | 26 |

**SEMESTER III**

| Class: S.Y.B.Sc | Branch: Computer Science | Semester: III | |
|---|---|---|---|
| **Subject: Operating System and Linux** | | | |
| Period per Week(Each 48 min) | Lecture | 04 | |
| | Practical | 02 | |
| | | **Hours** | **Marks** |
| Evaluation System | **Semester End Examination** | 2 hrs | 60 |
| | **Continuous Internal Assessment** | __ | 40 |
| | **Semester End Practical Examination** | - | - |
| | **Total** | __ | 100 |

<table>
<tr><td colspan="13"><b>UGCSC301 OS & Linux</b></td></tr>
<tr><td colspan="13"><b>Course Outcomes:</b>After successful completion of this course, students will be able to:<br>
<b>CO1:</b> Explain the working knowledge of operating System & Linux, from both a graphical and command line perspective, allowing them to easily use any Linux distribution.<br>
<b>CO2:</b> Apply UNIX/Linux utilities to create and manage simple file processing operations, organize directory structures with appropriate security, and develop shell scripts to perform more complex tasks.<br>
<b>CO3:</b> Determine as a Developer or Linux System Administrator using the acquired skill set and Identify system performance, network activities.<br>
<b>CO4:</b> Apply the knowledge of shell scripting and regular expressions</td></tr>
<tr><td colspan="13"><b>ICT Tools Used:</b>Videos, PPT, Chalk Board</td></tr>
<tr><td colspan="13"><b>Students Centric Methods:</b>Problem Solving and Participative<br>(Experimental, Participative, Problem Solving)</td></tr>
<tr><td colspan="13"><b>Links: SWAYAM/MOOCS</b>:<br>
1) https://nptel.ac.in/courses/117/106/117106113/<br>
2) https://nptel.ac.in/courses/106/105/106105214/</td></tr>
<tr><td colspan="13"><b>The CO-PO MappingMatrix</b></td></tr>
</table>

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | 1 | - | - | - | - | 2 | - | - | - | 2 |
| **CO2** | - | - | - | - | - | 2 | - | 3 | - | - | - | - |
| **CO3** | 2 | - | 1 | - | - | - | - | 3 | - | - | - | - |
| **CO4** | - | - | - | - | - | - | - | 2 | - | - | - | 1 |

| Course:<br>UGCSC301 | **Operating System and Linux**<br>(Credits : 4    Lectures/Week: 4) | Lectures |
|---|---|---|
| **Unit I** | **Introduction and Operating-Systems Structures**: Operating System Structure, Operations and Services; System Calls, Operating-System Design and Implementation;<br>**Process Management:** Process Scheduling and Operations; Interprocess Communication, Process Synchronization, Critical-Section Problem, Peterson's Solution, Semaphores,<br>**CPU Scheduling** – Scheduling criteria, Scheduling algorithms,<br>**Threads -** Overview, Multithreading models, Threading issues | **12 L** |
| **Unit II** | **Deadlock -** Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.<br>**Memory Management:** Contiguous Memory Allocation, Swapping, Paging, Segmentation, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files.<br>**Storage Management:** Mass-Storage Structure, Disk Structure, Scheduling and Management, RAID Structure. | **12L** |
| **Unit III** | **Introduction** History of Linux, Philosophy, Community, Terminology, Distributions, Linux kernel vs distribution.<br>**Installation** Hands on Installation using CD/DVD or USB drive.<br>**Linux Structure** Linux Architecture, File System basics, The boot process, init scripts, runlevels, shutdown process, Very basic introductions to Linux processes, Packaging methods: rpm/deb, Graphical Vs Command line.<br>**Graphical Desktop:** Basic Desktop Operations, Text editors: gedit, vi, vim, emacs, Graphics editors, Multimedia applications | **12L** |
| **Unit IV** | **Basic bash shell commands:** Starting the shell, Shell prompt, Filesystem Navigation, File and directory listing, File handling, Directory handling, Viewing file contents, Working with data files: Sorting, Searching, Compressing,<br>**Understanding Linux file permission:** Linux security, Using Linux groups, Decoding file permissions, Changing security settings,<br>**The Linux environment variable:** Environment variables, setting environment variables, Removing environment variables, setting the PATH environment variables, Using command aliases. | **12L** |
| **Unit V** | **Basic script building:** Using multiple commands, Creating a script file, Displaying messages, Using variables, Redirecting Input and Output, Pipes, Performing math, Exiting the script. | **12L** |

| | **Using structured commands:** Working with the if-then, if-then-else and nesting if statements, test command, the case command, Regular Expressions | |
|---|---|---|

**Textbook(s):**
1. Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts, Wiley,8th Edition
2. Linux Command line and Shell Scripting: Bible, Richard Blum, Wiley-India.
**Additional Reference(s):**
1. Achyut S. Godbole, Atul Kahate, Operating Systems, Tata McGraw Hill
2. Unix Concepts and Applications, 4e, Sumitabha Das., TMH.
3. Linux Complete Reference, TMH
4. Official Ubuntu Book, 8th Edit
**Links:**
1) Linux kernel Home: http://kernel.org
2) Open Source Initiative: https://opensource.org/
3) The Linux Foundation: http://www.linuxfoundation.org/
4) https://www.geeksforgeeks.org/last-minute-notes-operating-systems/
5)https://www.tutorialspoint.com/operating_system

| Sr. No. | Problems of UGCSC301<br>Practical /Week: 2 |
|---|---|
| 1 | a. Customize desktop environment by changing different default options like changing default background, themes, screensavers<br>b. Screen Resolution: Ascertain the current screen resolution for your desktop<br>c. Networking: Get the current networking configuration for your desktop. Are you on a wired or a wireless connection? What wireless networks are available, if any? |
| 2 | Command line operations:<br>a. Install any newpackage on your system<br>b. Remove the package installed<br>c. Find the passwd file in / using find command<br>d. Create an empty file example.txt and move it in /tmp directory using relative pathname.<br>e. Delete the file moved to /tmp in the previous step using absolute path.<br>f. Find the location of ls, ps, bash commands.<br>g. Use man command to find help for various commands |
| 3 | Try out the General Purpose Utility Commands |
| 4 | Use environment<br>a. Which account are you logged in? How do you find out?<br>b. Display /etc/shadow file using cat and understand the importance of shadow file. How it's different from a passwd file.<br>c. Get your current working directory.<br>d. Explore different ways of getting command history, how to run previously executed commands without typing it?<br>e. Create alias to most commonly used commands like. |
| 5 | Linux Editors: Vi Editor<br>a. Create,modify, search, navigate a file in the editor. |

| 6 | Linux Security:<br>a. Uses of root<br>a. Use of sudo command to change user privileges to root<br>b. Identify all operations that require sudo privileges<br>c. Create a new user and add it to sudo configuration file.<br>d. Set password for new user.<br>e. Modify the expiration date for new user using password ageing.<br>f. Delete newly added user. |
|:---:|:---|
| 7 | Arithmetic: Write a script which will work as arithmetic calculator to add, subtract, multiply, divide. The user should pass an argument on the command line a letter (a,s,m or d) and two numbers. If wrong number of arguments are passed then display an error message. |
| 8 | Case Statements: Write a script that will be given a month number as the argument and will translate this number into a month name. The result will be printed to stdout. |
| 9 | Write a Shell Script that accepts a file name, starting and ending line numbers as arguments and displays all lines between the given line numbers. |
| 10 | Programs using awk, sed command |

| Subject: Computer Networks | | | |
|:---:|:---|:---:|:---:|
| Period per Week(Each 48 min) | Lecture | 04 | |
| | Practical | 02 | |
| | | **Hours** | **Marks** |
| | **Semester End Examination** | 2 hrs | 60 |
| Evaluation System | **Continuous Internal Assessment** | __ | 40 |
| | **Semester End Practical Examination** | - | - |
| | **Total** | __ | 100 |

## UGCSC302 Computer Networks

**Course Outcomes:** After successful completion of this course, students will be able to:

**CO1:** Explain types of addresses, data communication, OSI model.

**CO2:** Examine the concepts of networking, which are important for them to be known as 'networking professionals'.

**CO3:** Analyze the concept of networking models, protocols connectionless and connection oriented, functionality of each layer.

**CO4:** Interpret routing Algorithms.

**ICT Tools Used:** Videos, PPT, Chalk Board

## The CO-PO MappingMatrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | - | - | - | 2 | - | - | - | - | - | - | - |
| CO2 | - | - | - | - | 1 | 2 | - | - | - | - | 1 | - |
| CO3 | - | - | 1 | - | 1 | 2 | - | - | 1 | - | - | - |
| CO4 | 2 | - | - | - | 1 | 2 | - | 1 | - | - | - | - |

| Course: UGCSC302 | Computer Networks<br>(Credits : 2       Lectures/Week: 4) | Lectures |
|------------------|------------------------------------------------------------|----------|
| **Unit I** | **Introduction** - Introduction to data communication, Components, Data Representation, Data Flow, Networks, Network Criteria, Physical Structures,<br>**Network types:** Local Area Network, Wide Area Network, MAN<br>**Network Models**: Protocol layering, OSI Model, TCP/IP Protocol Suite,<br>**Data and Signals**: Analog and Digital Data, Analog and Digital Signals, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth, Digital Signal, Bit Rate, Bit Length, Transmission of Digital Signals | 12 L |
| **Unit II** | **Transmission Impairments**: Attenuation, Distortion, Noise, Data Rate Limits, Performance, Bandwidth, Throughput, Latency (Delay)<br>**Digital Transmission** – Line Coding (Unipolar, Polar, Biphase), Block Coding(4B/5B Encoding), Analog to digital conversion, PCM, Transmission Modes, Parallel Transmission, Serial Transmission.<br>**Analog Transmission** – Digital to analog conversion (ASK,FSK,PSK, QAM), Analog to Analog conversion - Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation (PM), | 12 L |
| **Unit III** | **Multiplexing** – FDM, WDM, Synchronous TDM(time slots & frames, interleaving, data rate management), Spread Spectrum – FHSS, DSSS<br>**Transmission Media** – Guided & Unguided Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable, Infrared, Microwaves<br>**Switching** – Switching, Circuit-Switched Networks, Datagram networks, Concept of Virtual circuit networks, | 12 L |
| **Unit IV** | **Data Link Layer** –Error correction & detection, Types of errors, Detection VS Correction, Block Coding, Hamming Distance, Checksum | 12 L |

| | **Multiple Access** – Random(CSMA), Controlled(Reservation, Polling, Token Passing), Channelization(FDMA, TDMA, CDMA)<br>**Connecting Devices** – Repeaters, Hubs, Bridges, Spanning tree algorithm, Two & Three layer Switches, Routers, Gateways, Backbone networks, | |
|---|---|---|
| **Unit V** | **IPv4 addresses:** Address Space, Notations, Classful Addressing, NAT<br>**IPv6 addresses.**<br>Transition from IPv4 to IPv6,<br>**Routing Algorithms:** Distance-Vector Routing, Link-State Routing, Path-Vector Routing,<br>**Transport Layer** - UDP, TCP<br>**Congestion Control & Quality of Service**- Data traffic, Congestion, Congestion Control(Open Loop, Closed Loop ), QoS and Flow Characteristics<br>**Application Layer** - DNS, SMTP, FTP, | **12 L** |

**Textbook(s):**
1. Data Communications and Networking, Behrouz A. Forouzan, Fifth Edition, TMH, 2013.
2. Computer Network, Andrew S. Tanenbaum, David J. Wetherall, Fifth Edition, Pearson Education, 2011

**Additional Reference(s):**
1. Computer Network, Bhushan Trivedi, Oxford University Press
2. Data and Computer Communication, William Stallings, PHI

**Links:**
1) http://www.crectirupati.com/sites/default/files/lecture_notes/DCN%20NOTES.pdf
2) https://www.tutorialspoint.com/data_communication_computer_network/data_communication_computer_network_tutorial.pdf
3) https://mrcet.com/downloads/digital_notes/ECE/III%20Year/DATA%20COMMUNICATIONS.pdf

| Sr. No. | **Practicals of UGCSC302**<br>**Practical/week: 2** |
|---|---|
| 1 | a. Understanding the working of NIC cards, Ethernet/Fast Ethernet/Gigabit Ethernet.<br>b. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using crimping tool. |
| 2 | Using linux-terminal or Windows-cmd, execute following networking commands and note the output: ping, traceroute, netstat, arp, ipconfig. |
| 3 | a. Perform an Initial Switch Configuration<br>b. Perform an Initial Router Configuration |
| 4 | Using Packet Tracer, create a basic network of two computers using appropriate network wire |
| 5 | Using Packet Tracer, connect multiple (min.6) computers using layer 2 switch |
| 6 | Using Packet Tracer create a network using Star Topology |
| 7 | Using Packet Tracer create a network using Mesh Topology. |

| 8 | Using Packet Tracer, connect a network in triangular shape with three layer two switches and every switch will have four computers. Verify their connectivity with each other |
|---|---|
| 9 | Using Packet Tracer, create a wireless network of multiple PCs using appropriate access point. |
| 10 | Using Wireshark, network analyzer, set the filter for ICMP, TCP, HTTP, UDP, FTP and perform respective protocol transactions to show/prove that the network analyzer is working |

| Class: S.Y.B.Sc | Branch: Computer Science | | Semester: III | |
|---|---|---|---|---|
| Subject: Core Java | | | | |
| Period per Week(Each 48 min) | Lecture | | 04 | |
| | Practical | | 02 | |
| Evaluation System | | | Hours | Marks |
| | Semester End Examination | | 2 hrs | 60 |
| | Continuous Internal Assessment | | — | 40 |
| | Semester End Practical Examination | | - | - |
| | Total | | — | 100 |

## UGCSC303 Core JAVA

**Course Outcomes:** After successful completion of this course, students will be able to:

**CO1:** Recall the concept of Object oriented programming using Java & String manipulation.

**CO2:** Diagnose the abnormal termination of a java program using exception handling and multithreading.

**CO3:** Explain I/O Streams,Networking,Wrapper Classes in Java.

**CO4:** Describe the Collection framework, Inner class and AWT.

**ICT Tools Used:** Videos, PPT, ChalkBoard,Eclipse

**Students Centric Methods:** Problem Solving and Participative
(Experimental, Participative, Problem Solving)

**Links: SWAYAM/MOOCS:**
1)https://nptel.ac.in/courses/106/105/106105191/
2)https://onlinecourses.swayam2.ac.in/aic20_sp13/preview

## The CO-PO MappingMatrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 1 | 1 | - | 1 | - | 1 | - | - | - | - |
| CO2 | - | - | - | 2 | 1 | 2 | - | - | - | - | - | 1 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO3** | 2 | - | - | - | 1 | 2 | - | 1 | - | - | - | - |
| **CO4** | 2 | - | - | - | - | 2 | - | 1 | - | - | - | - |

| Course: UGCSC303 | Core Java (Credits : 2    Lectures/Week: 4) | Lectures |
|---|---|---|
| **Unit I** | **Introduction to OOP:** Classes,, Objects, Class Instantiation, Object Initialization, Life cycle of an object, Anonymous object, The four pillars of OOP:Abstraction, Encapsulation, Inheritance, Polymorphism<br>**Introduction to Java:**<br>What is Java?, History, Need and Features of Java, C++ vs Java, Hello World  in Java, Java environment setup(installation + path setup)?, JDK, JRE, and JVM (Java Virtual Machine), JVM Memory Management, Internal details of JVM, Z Garbage Collector**,** Unicode System, Operators, Keywords, Data Types, Variables, Naming convention of Java(Camel Casing), Constants, Literals and Control Statements like if-else, switch, For loop, while loop, etc.<br>**Practical Approach to OOP Concepts in Java**:<br>Implementing Classes & creating objects Constructor, "this" keyword, super keyword, implementation of inheritance Simple, Multilevel, Interfaces, Abstract classes and methods,  Implementation of Polymorphism, Method Overloading, Method Overriding, Nested and Inner classes, Access Specifiers | **12 L** |
| **Unit II** | Packages: Introduction to predefined packages (java.lang, java.util, java.io, java.sql, java.swing), User Defined Packages<br>**Wrapper classes:**Byte, Short, Integer, Long, Float, Double, Character, Boolean classes<br>**Array & String :** Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Operation on String, String Buffer, String Tokenizer | **12L** |
| **Unit III** | **Exception Handling: Exception:** Exception types, Using try catch and multiple   catch, Nested try, throw , throws and finally, Creating user defined Exceptions<br>**Multithreading:**<br>Thread    Creation,    Thread    Life    Cycle,    Life    Cycle    Methods Synchronization,- Wait(), -notify(), - notify all() methods<br>**File Handling:** Stream ByteStream Classes  CharacterStream Classes, File IO basics, File operations Creating file Reading file(character, byte ) Writing file (character, byte ) | **12L** |

| | | |
|---|---|---|
| **Unit IV** | **Networking:** Introduction, Socket, Server socket, Client –Server Communication<br>Collection:<br>Collection Framework, Interfaces: Introduction, util Package interfaces, List, Set, Map, List interface & its classes, Set interface & its classes, Map interface & its classes | **12L** |
| **Unit V** | **Event Handling:** Delegation Event Model, Events, Event classes,Event listener interfaces, Using delegation event model, adapter classes,layouts<br>**Swing:** Need for swing components, Components hierarchy, Panes, Swing components: Jlabel, JTextField **JavaFx**: Introduction to JavaFx, Scene Builder, Basic Controls(TexField, Password, Checkbox, RadioButton, TableView, ListView, FileChooser), Layout Panes, Event Handling. | **12L** |

**Textbook(s):**
1) Herbert Schildt, Java The Complete Reference, Ninth Edition, McGraw-Hill Education, 2014
**Additional Reference(s):**
1) E. Balagurusamy, Programming with Java, Tata McGraw-Hill Education India, 2014
2) Programming in JAVA, 2nd Ed, Sachin Malhotra & Saurabh Choudhary, Oxford Press
**Links:**
http://docs.oracle.com/javase/tutorial/
http://www.portcity.edu.bd/ELibrary/CSE/javaprogramming.pdf

| Sr. No. | Problems  of UGCSC303<br>Practical/week: 2 |
|---|---|
| 1 | Accept integer values for a, b and c which are coefficients of quadratic equation. Find the solution of quadratic equation |
| 2 | Accept two nxn matrices. Write a Java program to find addition of these matrices |
| 3 | Accept n strings. Sort names in ascending order. |
| 4 | Create a package: Animals. In the package animals create an interface Animal with suitable behaviors. Implement the interface Animal in the same package animals |
| 5 | Demonstrate Java inheritance using extends keyword |
| 6 | Demonstrate method overloading and method overriding in Java. |
| 7 | Demonstrate creating your own exception in Java. |
| 8 | Design and Develop simple Login Form using Swing and implements Events. |
| 9 | Design a Registration form using JavaFx and Implements Event. |
| 10 | Design simple calculator GUI application using JavaFX components and implements Event. |

| | | |
|---|---|---|
| **Class:** S.Y.B.Sc | **Branch:** Computer Science | **Semester:** III |

| Subject: Web Programming-I | | |
|---|---|---|
| Period per Week(Each 48 min) | Lecture | -- |
| | Practical | 02 |

| Evaluation System | | Hours | Marks |
|---|---|---|---|
| | **Semester End Practical Examination** | 2 hrs | 50 |
| | **Total** | __ | 50 |

## UGCSSECP304A Web Programming-I

**Course Outcomes:** After successful completion of this course, students will be able to:
**CO1:** Structure and implement HTML/CSS.
**CO**2: Apply intermediate and advanced web development practices
**CO3**: Implement basic JavaScript.
**CO4:** Create visualizations in accordance with UI/UX theories.

**ICT Tools Used:** Videos, PPT, Chalk Board

**Students Centric Methods:** Problem Solving and Participative
(Experimental, Participative, Problem Solving)

**Links: SWAYAM/MOOCS:**
1) https://nptel.ac.in/courses/106/108/106108227/
2) https://www.tutorialspoint.com/plsql/index.htm

## The CO-PO MappingMatrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | - | - | - | - | - | - | 3 | - | - | - | - |
| **CO2** | 1 | - | - | - | - | - | - | 3 | - | - | - | 2 |
| **CO3** | 1 | - | - | - | - | - | - | 3 | - | - | - | 3 |
| **CO4** | 1 | - | - | - | - | - | - | 3 | - | - | - | - |

| Course: UGCSSECP 304 A | Web Programming-I<br>(Credits : 2    Practicals/week: 2) | Lectures |
|---|---|---|
| **Unit I** | **Basics in Web Design**<br>Brief History of Internet, What is the World Wide Web, Why create a website, Web Standards Audience requirement.<br>**Introduction to Web Publishing or Hosting** | |

| | | |
|---|---|---|
| | Creating the Web Site, Saving the site, Working on the web site, Creating web site structure | |
| **Unit II** | **Introduction to HTML**<br>What is HTML, HTML Documents, Basic structure of an HTML document, Creating an HTML document, Markup Tags, Heading-Paragraphs, Line Breaks<br>HTML Tags.<br>**Elements of HTML**<br>Introduction to elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls.<br>**Introduction to Cascading Style Sheets**<br>Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model(Introduction, Border properties, Padding Properties, Margin properties), CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Color, Creating page Layout and Site Designs. | |
| **Unit III** | **Javascript**<br>Concept of script, Types of Scripts, Introduction to javascript, Variables, identifiers constants in javascript and examples of each. Operators in javascripts, various types of javascript, Operator Examples on javascript operators, Control and looping structure, examples on control and looping structures (if, if…else, for, while, do while, switch, etc) Concept of array, how to use it in javascript , types of an array, examples Methods of an array, examples on it. Event handling in javascript with examples Math and date object and examples on it. String object and examples on it, and some predefined functions DOM concept in javascript, DOM objects Window navigator, History object and its methods, Location object with methods and examples Validations in javascript , examples on it.. | |

**Textbook(s):**
1. HTML 5 in simple steps Kogent Learning Solutions Inc. Dreamtech Press
2. A beginner's guide to HTML NCSA,14th May,2003
3. JavaScript Bible, Wiley Pub.
4. HTML, DHTML, JavaScript, Perl & CGI Ivan Bayross, BPB Pub

**Additional Reference(s):**
1. HTML, XHTML, and CSS Bible Fifth Edition, Steven M. Schafer, WILEY
2. Learn to Master HTML 5, scriptDemics, StarEdu Solutions Pvt Ltd.
3. Web Designing & Architecture-Educational Technology Centre University of Buffalo
4. Beginning HTML, XHTML, CSS, and JavaScript John Duckett Wiley
   India
**Links:**

| Sr. No. | Problems of UGCSSECP304 A |
|---|---|
| 1 | Design a webpage that makes use of<br>    1) Document Structure Tags<br>    2) Various Text Formatting Tags<br>    3) List Tags<br>  Image and Image Maps |
| 2 | Design a webpage that makes use of<br>    1) Table tags<br>    2) Form Tags (forms with various form elements)<br>    3) Navigation across multiple pages<br>    4) Embedded Multimedia elements<br>Practicing Hyper linking of webpages |
| 3 | Design a webpage that make use of Cascading Style Sheets with<br>   a) CSS properties to change the background of a Page<br>   b) CSS properties to change Fonts and Text Styles<br>   c) CSS properties for positioning an element |
| 4 | Write a CSS program to use css style lists with colors. |
| 5 | Write a example on Pseudo-classes. |
| 6 | Write JavaScript code for<br>     a) Performing various mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number<br>     b) Validating the various Form Elements |
| 7 | Write JavaScript code for<br>    a) Demonstrating different JavaScript Objects such as String, RegExp, Math, Date<br>    b) Demonstrating different JavaScript Objects such as Window,<br>    c) Navigator, History, Location, Document, Storing and Retrieving Cookies |
| 8 | Create a simple multiplication table asking the user the number of rows and columns he wants. |
| 9 | Create a sample form program that collects the first name, last name, email, user id, password and confirms password from the user. All the inputs are mandatory and the email address entered should be in the correct format. Also, the values entered in the password and confirm password text boxes should be the same. After validating using JavaScript, In output display proper error messages in red color just next to the textbox where there is an error. |
| 10 | Write a program on JavaScript Array directly (new keyword). |

| Class: S.Y.B.Sc | Branch: Computer Science | | Semester: III | |
|---|---|---|---|---|
| Subject: PL/SQL I | | | | |
| Period per Week(Each 48 min) | Lecture | | 03 | |
| | Practical | | 02 | |
| Evaluation System | | | Hours | Marks |
| | Semester End Practical Examination | | 2Hrs | 50 |
| | Total | | — | 50 |

## UGCSSECP304B PL/SQL-I

**Course Outcomes:** After successful completion of this course, students will be able to:

**CO1:** Define the variables, constants, operators and data type of the database system.
**CO2:** Describe the structure of control statements.
**CO3:** Contract the stored procedures and Function in DBMS.
**CO4:** Apply Rollback and Commit operations on Database.

**ICT Tools Used:** Videos, PPT, Chalk Board

**Students Centric Methods:** Problem Solving and Participative
(Experimental, Participative, Problem Solving)

**Links: SWAYAM/MOOCS:**
1) https://nptel.ac.in/courses/106/108/106108227/
2) https://www.tutorialspoint.com/plsql/index.htm

## The CO-PO MappingMatrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 1 | - | 1 | 1 | - | | - | - | - | - |
| CO2 | 3 | - | - | 1 | 1 | - | - | - | - | - | - | - |
| CO3 | - | - | - | 1 | 2 | 2 | - | - | - | - | - | - |
| CO4 | - | - | - | - | - | 2 | - | 2 | - | - | - | - |

| Course: UGCSSEC3 04 B | PL/SQL I<br>(Credits : 2      Practicals/Week: 2) | Lectures |
|---|---|---|
| Unit I | **Fundamentals of PL/SQL:** Defining variables and constants<br>**PL/SQL expressions and comparisons:** Logical Operators, Boolean Expressions, CASE Expressions Handling, Null Values in Comparisons and Conditional Statements<br>**PL/SQL Datatypes:** Number Types, Character Types, Boolean Type, Datetime and Interval Types. | |
| Unit II | **Overview of PL/SQL Control Structures:**<br>**Conditional Control:** IF and CASE Statements, IF THEN Statement, IF-THEN-ELSE Statement, IF-THEN-ELSIF Statement, CASE Statement<br>**Iterative Control:** LOOP and EXIT Statements, WHILE-LOOP, FOR-LOOP<br>**Sequential Control:** GOTO and NULL Statements, Concept of nested tables | |
| Unit III | **Stored Procedures:** Types and benefits of stored procedures, creating stored procedures, executing stored procedures, altering stored procedures, viewing stored procedures. PROCEDURE with Parameters (IN,OUT and IN OUT)<br>**Functions:** Difference between Procedures and Functions,User Defined Functions,Nested Functions,Using stored function in SQL statements | |

**Textbook(s):**
1. Ivan Bayross, "SQL,PL/SQL -The Programming language of Oracle", B.P.B. Publications
2. Murach's Oracle SQL and PL SQL by Joel Murach, Murach and Associates.
**Additional Reference(s):**
1. Oracle PL/SQL Programming, Fifth Edition By Steven Feuerstein, Bill Pribyl
2. Dr. P.S. Deshpande, SQL and PL/SQL for Oracle 10g, Black Book, Dreamtech Press.
3. Oracle Database 11g PL/SQL Programming Workbook, ISBN : 9780070702264, By : Michael McLaughlin, John Harper, Tata McGrawHill
4. Oracle 11g : PL/SQL Reference Oracle Press.
**Links:**
1) https://docs.oracle.com/database/121/LNPLS/toc.htm
2) https://www.tutorialspoint.com/plsql/index.htm
3) https://www.javatpoint.com/pl-sql-tutorial

| Sr. No. | Practicals  of UGCSSECP304 B |
|---|---|
| 1 | Write a PL/SQL block for Conditional Control |
| 2 | Write a PL/SQL block for Iterative Control |
| 3 | Write a PL/SQL block for Sequential Control |
| 4 | Write a  Procedures in PL/SQL Block (IN, OUT, INOUT, DEFAULT keywords).<br>a. Create an empty procedure, replace a procedure and call procedure |

| | |
|---|---|
| | b. Create a stored procedure and call it<br>c. Define procedure to insert data<br>d. A forward declaration of procedure |
| 5 | Write a Functions in PL/SQL Block.<br>a. Define and call a function<br>b. Define and use function in select clause,<br>c. Call function in dbms_output.put_line<br>d. Recursive function<br>e. Count Employee from a function and return value back<br>f. Call function and store the return value to a variable |

| Class: S.Y.B.Sc | Branch: Computer Science | | Semester: III | |
|---|---|---|---|---|
| **Subject:** Descriptive Statistics - II | | | | |
| Period per Week(Each 48 min) | Lecture | | 04 | |
| | Practical | | 02 | |
| Evaluation System | | | **Hours** | **Marks** |
| | **Semester End Examination** | | 2 hrs | 60 |
| | **Continuous Internal Assessment** | | — | 40 |
| | **Semester End Practical Examination** | | - | - |
| | **Total** | | — | 100 |

| **UGCSGE305A: Descriptive Statistics - II** |
|---|
| **Course Outcomes:**After successful completion of this course, students will be able to:<br>    **CO1:** Develop the concept of probability.<br>    **CO2:** Utilize basic concepts of probability including independence and conditional probability to calculate,       interpret and communicate event probabilities<br>    **CO3:** Inferential statistics helps us to infer properties of the population from a given sample of data. |
| **ICT Tools Used:**Videos, PPT, Chalk Board |
| **Students Centric Methods:**Problem Solving and Participative<br>(Experimental, Participative, Problem Solving) |
| **Links: SWAYAM/MOOCS**:<br>1)https://nptel.ac.in/courses/106/108/106108227/<br>2)https://www.tutorialspoint.com/plsql/index.htm |
| **The CO-PO MappingMatrix** |

| CO\PO | PO | PO | PO | PO | PO | PO | PO | PO | PO | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | - | 2 | - | - | - | 1 | - | - | - | - |
| **CO2** | - | - | - | 3 | - | - | - | - | - | - | - | - |
| **CO3** | - | - | - | 1 | - | - | 1 | - | - | - | - | - |

| Course:<br>UGCSGE305A | Descriptive Statistics - II<br>(Credits : 2        Lectures/Week: 5) | Lectures |
|---|---|---|
| **Unit I** | <mark>Probability</mark> : Random experiment, sample space, events types and operations of events<br>**Probability definition : classical, axiomatic, Elementary Theorems of probability (without proof)** $0 \leq P(A) \leq 1$, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ ,$P(A') = 1 - P(A)$, $P(A) \leq P(B)$ if $A \subset B$ Conditional probability, 'Bayes' theorem, independence, Examples on Probability | 15 L |
| **Unit II** | **Standard distributions and Mathematical Expectation and Variance::** Definition of a discrete random variable and continuous random variable, expectation     and variance of a random variable, pmf, pdf, cdf, reliability<br>**Introduction and properties without proof for following**<br>**distributions:** Binomial distribution, Normal distribution, Chi-square distribution, t distribution, F distribution | 15 L |
| **Unit III** | <mark>Hypothesis testing:</mark> one sided, two sided hypothesis, critical region, p-value, tests based on t, Normal and F, confidence intervals.<br>**Analysis of variance :** One-way, two-way analysis of variance | 15 L |
| **Unit IV** | <mark>Non-parametric tests:</mark> need of non-parametric tests, sign test, Wilicoxon's signed rank test, run test, Kruskal-Walis tests.<br>**Post-hoc analysis of one-way analysis of variance :** Duncan's test Chi-square test of association | 15 L |

**Textbook(s):**
1) Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi
2) Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, The World Press Pvt. Ltd., Calcutta.

**Additional Reference(s):**
1) Mood, A. M. and Graybill, F. A. and Boes D.C. (1974). Introduction to the Theory of Statistics,Ed. 3, McGraw Hill Book Company.
2) Hoel P. G. (1971). Introduction to Mathematical Statistics, John Wiley and Sons, New York.
3) Hogg, R.V. and Craig R.G. (1989). Introduction to Mathematical Statistics, Ed. MacMillan Publishing Co., New York.
4) Walpole R. E., Myers R. H. and Myers S. L. (1985), Probability and Statistics for Engineers and Scientists
5) Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International

Publishers, New Delhi.
6) Ross, S.M. (2006): A First course in probability. 6th Ed$^n$ Pearson
7) Kulkarni, M.B., Ghatpande, S.B. and Gore, S.D. (1999): common statistical tests. Satyajeet Prakashan, Pune

**Links:**
1. https://faculty.ksu.edu.sa/sites/default/files/677_fr37hij.pdf
2. https://www.geeksforgeeks.org/mathematics-probability/
3. https://faculty.ksu.edu.sa/sites/default/files/marcel.dekker_-_probability.and_.statistical.inference.pdf
4. https://www.tutorialspoint.com/statistics/index.htm

| Sr. No. | Practicals of UGCSGE305 A |
|---|---|
| 1 | Probability practical on<br>a. Probability definition: classical, axiomatic<br>b. Elementary Theorems of probability |
| 2 | Conditional probability and independence practical on<br>a. Conditional probability<br>b. 'Bayes' theorem<br>c. independence |
| 3 | Discrete random variable-<br>a. Probability distribution of discrete random variable<br>b. Probability mass function |
| 4 | Continuous random variable- a. Probability distribution of continuous random variable b. Probability density function |
| 5 | Mathematical Expectation and Variance-<br>a. Mean of discrete and continuous Probability distribution<br>b. S.D. and variance of discrete and continuous Probability distribution |
| 6 | Standard probability distributions-<br>a. Practical on to find probability, mean and variance based on Binomial distribution<br>b. Practical on to find probability based on Normal distribution |
| 7 | Large Sample tests based on Normal (Z) -<br>a. Test of significance for proportion (Single proportion Ho: $P = P_o$)<br>b. Test of significance for difference between two proportions (Double proportion Ho: $P_1 = P_2$)<br>c. Test of significance for mean (Single mean Ho: $\mu = \mu_0$)<br>d. Test of significance for difference between two means. (Double mean Ho: $\mu_1 = \mu_2$) |
| 8 | Small sample tests based on t and F-<br>a. t-test for significance of single mean, population variance being unknown (Single mean Ho : $\mu = \mu_0$ )<br>b. t-test for significance of the difference between two sample means (Independent samples)<br>c. t-test for significance of the difference between two sample means (Related samples)<br>d. F-Test to Compare Two Variances |
| 9 | Analysis of variance -<br>a. Perform One-way ANOVA |

| | |
|---|---|
| | b. Perform Two-way ANOVA |
| 10 | Non-parametric tests-<br>  a. Sign test and Wilcoxon Sign rank test<br>  b. Run test<br>  c. Kruskal-Wallis (H) test<br>  d. Chi-square test |
| Note: To be implemented in R | |

<br>

| Class: S.Y.B.Sc | Branch: Computer Science | | Semester: III | |
|---|---|---|---|---|
| Subject: Game Programming | | | | |
| Period per Week(Each 48 min) | Lecture | | 04 | |
| | Practical | | 02 | |
| Evaluation System | | | Hours | Marks |
| | Semester End Examination | | 2 hrs | 60 |
| | Continuous Internal Assessment | | — | 40 |
| | Semester End Practical Examination | | - | - |
| | Total | | — | 100 |

<br>

## UGCSGE305B Game Programming

**Course Outcomes:** After successful completion of this course, students will be able to:

  **CO1:** Determine the concept of coordinate system & transformation for computer graphics.
  **CO2:** Establish the knowledge of DirectX with understanding GPU architectures.
  **CO3:** Compute  the Unity Editor to create 2D and 3D games, apps.
  **CO4:**  Interpret the concept of Rendering Pipeline.

**ICT Tools Used:** Videos, PPT, Unity tool, DirectX framework

**Students Centric Methods:** Problem Solving and Participative
(Experimental, Participative, Problem Solving)

**Links: SWAYAM/MOOCS:**
1)https://www.udemy.com/course/unitycourse/
2)https://www.edx.org/course/introduction-to-video-game-development-with-unity

## The CO-PO MappingMatrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| CO2 | 1 | - | - | - | - | - | - | 2 | - | - | - | - |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO3** | - | - | - | - | - | 2 | - | 3 | - | - | - | - |
| **CO4** | 2 | - | - | - | - | - | - | - | - | - | - | 2 |

| Course:<br>UGCSGE30<br>5 B | **Game Programming**<br>(Credits : 2     Lectures/Week: 6) | Lectures |
|---|---|---|
| **Unit I** | **Mathematics for Computer Graphics, DirectX Kickstart:**<br>**Cartesian Coordinate system**: The Cartesian XY-plane, Function Graphs, Geometric Shapes, Polygonal Shapes, Areas of Shapes, Theorem of Pythagoras in 2D, Coordinates, Theorem of Pythagoras in 3D, 3D Polygons, Euler's Rule<br>**Vectors:** Vector Manipulation, multiplying a Vector by a Scalar, Vector Addition and Subtraction, Position Vectors, Unit Vectors, Cartesian Vectors, Vector Multiplication, Scalar Product, Example of the Dot Product, The Dot Product in Lighting Calculations, The Dot Product in Back-Face Detection, The Vector Product, The Right-Hand Rule, deriving a Unit Normal Vector for a Triangle Areas, Calculating 2D Areas<br>**Transformations:** 2D Transformations, Matrices, Homogeneous Coordinates, 3D Transformations, Change of Axes, Direction Cosines, rotating a Point about an Arbitrary Axis, Transforming Vectors, Determinants, Perspective Projection, Interpolation<br> **DirectX**: Understanding GPU and GPU architectures. How are they different from CPU Architectures? Understanding how to solve by GPU?. | **12 L** |
| **Unit II** | **DirectX Pipeline and Programming**:<br>Introduction To DirectX 11: COM, Textures and Resources Formats, The swap chain and Page flipping, Depth Buffering, Texture Resource Views, Multisampling Theory and MS in Direct3D, Feature Levels<br>**Direct3D 11 Rendering Pipeline:** Overview, Input Assembler Stage (IA), Vertex Shader Stage (VS), The Tessellation Stage (TS), Geometry Shader Stage (GS), Pixel Shader Stage (PS), Output merger Stage (OM) Understanding Meshes or Objects, Texturing, Lighting, Blending. Interpolation and Character Animation:<br>**Trigonometry:** The Trigonometric Ratios, Inverse Trigonometric Ratios, Trigonometric Relationships, The Sine Rule, The Cosine Rule, Compound Angles, Perimeter Relationships<br>**Interpolation:** Linear Interpolant, Non-Linear Interpolation, Trigonometric Interpolation, Cubic Interpolation, Interpolating Vectors, Interpolating Quaternions<br>**Curves:** Circle, Bezier, B-Splines<br>**Analytic Geometry:** Review of Geometry, 2D Analytic Geometry, Intersection Points, Point in Triangle, and Intersection of circle with straight line. | **12 L** |
| **Unit III** | **Introduction to Rendering Engines**: Understanding the current market Rendering Engines. Understanding AR, VR and MR.Depth Mappers, Mobile Phones, Smart Glasses, HMD's<br>**Unity Engine**: Multi-platform publishing, VR + AR: Introduction and working in Unity, 2D, Graphics, Physics, Scripting, Animation, Timeline, Multiplayer and Networking, UI, Navigation and Pathfinding, XR, Publishing.<br>**Scripting:** Scripting Overview, Scripting Tools and Event Overview<br>**XR:** VR, AR, MR, Conceptual Differences. SDK, Devices | **12 L** |
| **Text Books** | | |

1) Mathematics for Computer Graphics, John Vince, Springer-Verlag London, 5th Edition,2017
2) Mathematics for 3D Game Programming and Computer Graphic, Eric Lengyel, Delmar Cengage Learning, Delmar Cengage Learning,2011
3) Introduction To 3D Game Programming With Directx® 11,Frank D Luna, Mercury Learning And Information,2012.
4) https://docs.unity3d.com/Manual/index.html - Free

**Additional References**
1) Computer Graphics, C Version, Donald Hern and Pauline Baker, Pearson Education, 2nd Edition, 1997
2) HLSL Development Cookbook, Doron Feinstein, PACKT Publishing,2013

**Links**
1) 1.http://www.dphu.org/uploads/attachements/books/books_138_0.pdf
2) 2. https://d-nb.info/96125291x/04

| Sr. No. | Practicals of UGCSGE305 B |
|---|---|
| 1 | Setup DirectX 11, Window Framework and Initialize Direct3D Device |
| 2 | Buffers, Shaders and HLSL (Draw a triangle using Direct3D 11) |
| 3 | Texturing (Texture the Triangle using Direct 3D 11) |
| 4 | Lightning (Programmable Diffuse Lightning using Direct3D 11) |
| 5 | Specular Lightning (Programmable Spot Lightning using Direct3D 11) |
| 6 | Loading models into DirectX 11 and rendering. |
| 7 | https://unity3d.com/learn/tutorials/s/2d-ufo-tutorial. |
| 8 | https://unity3d.com/learn/tutorials/s/space-shooter-tutorial |
| 9 | https://unity3d.com/learn/tutorials/s/roll-ball-tutoria |
| 10 | https://unity3d.com/learn/tutorials/topics/vr/introduction?playlist=22946 |
| | **Note:** Perform Practical no 7 TO 10 using online content from the Unity Tutorials Web--sites: https://unity3d.com/learn/tutorials/s/interactive-tutorials |

**SEMESTER IV**

| Class: S.Y.B.Sc | Branch: Computer Science | Semester: IV |
|---|---|---|
| Subject: Advanced Java | | |
| Period per Week(Each 48 min) | Lecture | 04 |
| | Practical | 02 |

| | | Hours | Marks |
|---|---|---|---|
| | **Semester End Exam** | 2 hrs | 60 |
| Evaluation System | **Continuous Internal Assessment** | — | 40 |
| | **Semester End Practical Examination** | — | — |
| | **Total** | ___ | 100 |

## UGCSC401 Advanced JAVA

**Course Outcomes:** After successful completion of this course, students will be able to:

**CO1:** Describe the JDBC architecture and Perform the connectivity with the database , the servlet , its features and Develop the web application.

**CO2:** Discuss the JSP LifeCycle ,its object and Give the various examples on them and JSF as an application with its component.

**CO3:** Elaborate the architecture of basic MVC and Struts 2 framework and JavaBeans architecture.

**CO4:** Analyze JSON object notation with java.

**ICT Tools Used:** Videos, PPT, Chalk Board

**Students Centric Methods:** Problem Solving and Participative
(Experimental, Participative, Problem Solving)

**Links: SWAYAM/MOOCS:**
1)https://nptel.ac.in/courses/106/108/106108227/
2)https://onlinecourses.swayam2.ac.in/nou21_ge41/preview

### The CO-PO MappingMatrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | 2 | - | 2 | - | - | - | - |
| CO2 | 2 | - | - | - | 1 | 2 | - | 1 | - | - | - | - |
| CO3 | 3 | - | - | - | 1 | 1 | - | 1 | - | 1 | - | - |
| CO4 | 2 | - | - | - | - | 1 | - | 1 | - | - | - | - |

| Course: UGCSC401 | **Advanced Java** (Credits : 2  Lectures/Week: 4) | Lectures |
|---|---|---|

| | | |
|---|---|---|
| **Unit I** | **JDBC:** Introduction, JDBC Architecture, Types of Drivers, Statement, ResultSet, Read Only ResultSet, Updatable ResultSet, Forward Only ResultSet, Scrollable ResultSet,PreparedStatement, Connection Modes, SavePoint, Batch Updations, CallableStatement, BLOB & CLOB, row sets, metadata, Transaction<br>**Understanding Java EE:** What is an Enterprise Application?<br>What Is Java Enterprise Edition? JavaEETechnologies, JavaEEevolution, Glassfish Server, JavaEE Architecture,Server And Containers: TypesofSystemArchitecture, JavaEEServer, JavaEEContainers. | **12 L** |
| **Unit II** | **Introduction to servlets:**Introduction, Web application Architecture, Http Protocol & Http Methods, Web Server & Web Container, why servlets?<br>**Servlet API and Lifecycle:** Servlet Interface, GenericServlet, HttpServlet, Servlet Life Cycle, ServletConfig, ServletContext, ServletInputStream and ServletOutputStream.<br>Servlet Communication,Cookies, Session Tracking Mechanisms,Request Dispatcher | **12 L** |
| **Unit III** | **JSP**: Introduction, JSP LifeCycle, JSP Implicit Objects & Scopes, JSP Directives, JSP Scripting Elements, JSP Actions: Standard actions and customized actions, unified expression language<br>**Java Server Pages Standard Tag Libraries**:<br>What is wrong in using JSPScriptletTags?<br>HowJSTLFixesJSPScriptlet'sShortcomings? Disadvantages Of JSTL, TagLibraries. | **12 L** |
| **Unit-IV** | **Java Beans:**Introduction, JavaBeans Properties, **EJB**: Enterprise bean architecture, Benefits of enterprise bean, types of beans, Accessing beans , packaging beans, creating web applications, creating enterprise bean, creating web client, creating JSP file, building and running web applications. | **12 L** |
| **Unit-V** | **Struts 2:** Basic MVC Architecture, Struts 2 framework features, Struts 2 MVC pattern, Request life cycle, Examples, Configuration Files, Actions, Interceptors, Results & Result Types, Value Stack/OGNL<br>**JSON:** Overview, Syntax, DataTypes, Objects, Schema, Comparison with XML, JSON with Java | **12 L** |
| | **Textbook(s):**<br>1) 1) Cay S. Horstmann, Gary Cornell, Core Java™ 2: Volume II–Advanced Features Prentice Hall PTR,9th Edition<br> 2) Herbert Schildt, Java2: The Complete Reference, Tata McGraw-Hill,5th Edition<br> 3) Joe Wigglesworth and Paula McMillan, Java Programming: Advanced Topics, Thomson Course Technology (SPD) ,3rd Edition<br>4)Java EE 6 for Beginners, Sharanam Shah, Vaishali Shah, Shroff Publishers and Distributors<br>**Additional References(s):** | |

1) Java EE Project using EJB 3, JPA and struts 2 for beginners, Shah, SPD Java Programming A practical Approach, C Xavier, McGraw Hill Java 2)Server Faces A practical Approach for beginners, B M Harwani, Eastern Economy Edition (PHI).
3)The Java Tutorials of Sun Microsystems Inc
4)Advanced Java Programming, Uttam K. Roy, Oxford University Press

**Links:**
    **1)** http://docs.oracle.com/javase/tutorial/)

| Sr. No. | Practical of  UGCSC401 |
| --- | --- |
| 1 | Develop simple Registration Form using Swing and stored record and retrieve record in database using JDBC |
| 2 | Develop a Java application to store image in a database as well as retrieve image from database. |
| 3 | Implement the following Simple Servlet applications.<br>    a) Create a simple calculator application using servlet.<br>    b) Create a servlet for a login page. If the username and password are correct then it<br>    c) says message "Hello <username>" else a message "login failed"<br>    d) Create a registration servlet in Java using JDBC. Accept the details such as Username, Password, Email, and Country from the user using HTML Form and store the registration details in the database. |
| 4 | Using Request Dispatcher Interface create a Servlet which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed. |
| 5 | Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-radio button). |
| 6 | Create Employees table in EMP database. Perform CRUD operations on Employee table using JSP. |
| 7 | Create a JSP application to demonstrate the use of JSTL. |
| 8 | Develop a Room Reservation System Application Using Enterprise Java Beans. |
| 9 | Design application using Struts2. Application must accept user name and greet user when command button is pressed. |
| 10 | Write Java application to encoding and decoding JSON in Java. |

| Class: S.Y.B.Sc | Branch: Computer Science | Semester: IV |
|---|---|---|
| Subject: Software Engineering | | |

| Period per Week(Each 48 min) | Lecture | 03 | |
|---|---|---|---|
| | Practical | 04 | |
| Evaluation System | | Hours | Marks |
| | Semester End Exam | 2 hrs | 60 |
| | Continuous Internal Assessment | — | 40 |
| | Semester End Practical Examination | — | — |
| | Total | ___ | 100 |

## UGCSC402 Software Engineering

**Course Outcomes:**After successful completion of this course, students will be able to:

**CO1:**Visualize software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

**CO2:**Illustrate the techniques and diagrams related to structural modeling

**CO3:** Analyze the concept of Project Scheduling and Project Management.

**CO4:** correlate the current theories, models, and techniques that provide a basis for the software lifecycle and to use the techniques and tools necessary for engineering practice

**ICT Tools Used:**Videos, PPT, Chalk Board

**Students Centric Methods:**Problem Solving and Participative
(Experimental, Participative, Problem Solving)

**Links: SWAYAM/MOOCS:**
1)https://nptel.ac.in/courses/106/105/106105218/
2)https://nptel.ac.in/courses/106/105/106105182/
3)

## The CO-PO MappingMatrix

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | 2 | - | 1 | - | - | - | - | 1 |
| CO2 | 1 | - | 2 | - | 1 | 1 | - | 1 | - | - | - | 2 |
| CO3 | - | - | 1 | 2 | - | - | - | - | - | - | - | 1 |
| CO4 | 1 | - | - | - | - | - | - | - | - | - | - | 3 |

| Course: UGCSC402 | Software Engineering (Credits : 2      Lectures/Week: 5) | Lectures |
|---|---|---|

| | | |
|---|---|---|
| Unit I | **Introduction:** The Nature of Software, Software Engineering, The Software Process, Generic Process Model, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Component-Based Development, The Unified Process Phases, Agile Development- Agility, Agile Process, Extreme Programming <br> **Software Requirements Analysis and Specification:** Requirements Engineering, Eliciting Requirements, SRS Validation, Components of SRS,Characteristics of SRS. | **12 L p** |
| Unit II | **System Modeling:** <br> Object-oriented design using the UML - Class diagram, Object diagram, Use case diagram, Sequence diagram, Collaboration diagram, State chart diagram, Activity diagram, Component diagram, Deployment diagram <br> **System Design:** System/Software Design, Architectural Design, Low-Level Design Coupling and Cohesion, Functional-Oriented Versus The Object-Oriented Approach, Design Specifications, Verification for Design, Monitoring and Control for Design. | **12 L** |
| Unit III | **Project Scheduling** - Basic Principles, Relationship Between People and Effort, Effort Distribution, Time-Line Charts <br> **Software Measurement and Metrics:** Product Metrics – Measures, Metrics, and Indicators, Function-Based Metrics, Metrics for Object-Oriented Design, Operation-Oriented Metrics, User Interface Design Metrics, Metrics for Source Code, Halstead Metrics Applied to Testing, Metrics for Maintenance, Cyclomatic Complexity, Software Measurement - Size-Oriented, Function-Oriented Metrics, Metrics for Software Quality | **12 L** |
| Unit-IV | **Software Project Management: Estimation** in Project Planning Process –Software Scope And Feasibility, Resource Estimation, Empirical Estimation Models – COCOMO II, Estimation for Agile Development, The Make/Buy Decision <br> **Risk Management** - Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan | **12 L** |
| Unit-V | **Software Configuration Management:** An SCM Scenario, Elements of a Configuration Management System, Baselines Software Configuration Items, Management of Dependencies and Changes <br> **The SCM Repository:** General Features and Content, SCM Features <br> **The SCM Process:** Identification of Objects in the Software Configuration, Version Control, Change Control,Impact Management,Configuration Audit, Status Reporting <br> **Maintenance And Reengineering:** Software Maintenance, Software Supportability,**Reengineering Business Process Reengineering**: Business Processes, A BPR Model, **Software Reengineering:** Software Reengineering Process Model ,Software Reengineering Activities | **12 L** |
| | **Textbook(s):** <br> 1) Software Engineering, A Practitioner's Approach, Roger S, Pressman.(2014) <br> **Additional References(s):** <br> 1) Software Engineering, Ian Sommerville, Pearson Education | |

2) Software Engineering: Principles and Practices",Deepak Jain,OXFORD University Press,
3) Fundamentals of Software Engineering, Fourth Edition, Rajib Mall, PHI
4) Software Engineering: Principles and Practices, Hans Van Vliet, John Wiley & Sons
5) A Concise Introduction to Software Engineering, Pankaj Jalote, Springer
**Links:**
1.http://www.resource.mitfiles.com/IT/II%20year/IV%20sem/Software%20Engineering/books/Pressman__Software_Engineering.pdf
2.https://edisciplinas.usp.br/pluginfile.php/2150022/mod_resource/content/1/1429431793.203Software%20Engineering%20by%20Somerville.pdf
3.https://jnec.org/Lab-manuals/CSE/CSE1/BE-Part-1/VM.pdf
4.http://www.startertutorials.com/uml/resources/UML%20and%20DP%20Lab%20Manual.pdf

| Sr. No. | Problems of UGCSC402 |
|---------|----------------------|
| 1 | Study the complete Software Development Life Cycle (SDLC) and analyze various activities conducted as a part of various phases. For each SDLC phase, identify the objectives and summaries outcomes. |
| 2 | Choose a hypothetical system of significant complexity and write an SRS for the same. |
| 3 | Draw one or more Use Case diagrams for capturing and representing requirements of the system. |
| 4 | Draw basic class diagrams to identify and describe key concepts like classes, types in your system and their relationships. |
| 5 | Draw sequence diagrams OR communication diagrams with advanced notation for your system to show objects and their message exchanges. |
| 6 | Draw activity diagrams to display either business flows or like flow charts. |
| 7 | Draw component diagrams assuming that you will build your system reusing existing components along with a few new ones. |
| 8 | Draw deployment diagrams to model the runtime architecture of your system. |
| 9 | Demonstrate the Cyclomatic Complexity. |
| 10 | Demonstrate the functional Dependency. Refer: https://www.educba.com/functional-point-analysis/ |

| Class: S.Y.B.Sc | Branch: Computer Science | Semester: IV |
|---|---|---|
| **Subject: Dot Net Technologies with C#** | | |
| Period per Week(Each 48 min) | Lecture | 04 |
| | Practical | 02 |

| Evaluation System | | Hours | Marks |
|---|---|---|---|
| | **Semester End Exam** | 2 hr | 60 |
| | **Continuous Internal Assessment** | __ | 40 |
| | **Semester End Practical Examination** | 3 | 50 |
| | **Total** | __ | 150 |

## UGCSC403 .NET Technologies

**Course Outcomes:** After successful completion of this course, students will be able to:

**CO1:** Examine the Microsoft .NET Framework and ASP.NET page structure

**CO2:** Operate the Master pages, Data binding , LINQ, Rich control,Use page layout, styles, text balance, site map, Master pages and content Pages.

**CO3:** Visualize ADO.NET for data persistence in a web application.

**CO4:** Create dynamic web pages using c# code, ASP.Net, .MS Visual Studio, NET IDE and Console Applications.

**ICT Tools Used:** Videos, PPT, Chalk Board

**Students Centric Methods:** Problem Solving and Participative
(Experimental, Participative, Problem Solving)

**Links: SWAYAM/MOOCS:**
1)https://nptel.ac.in/courses/106/101/106101208/

| Course: UGCSC403 | Dot Net Technologies with C#<br>(Credits : 3          Lectures/Week: 4) | Lectures |
|---|---|---|
| **Unit I** | **The .NET Framework:.**NET Languages, Common Language Runtime, .NET Class Library<br> **C# Language Basics:** Comments, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods, Classes, Value Types and Reference Types, Namespaces and Assemblies, Inheritance, Static Members, Casting Objects, Partial Classes<br>**ASP.NET:** Creating Websites, Anatomy of a Web Form - Page Directive, Doctype, Writing Code - Code-Behind Class, Adding Event Handlers, Anatomy of an ASP.NET Application - ASP.NET File Types, ASP.NET Web Folders, | 15 L |
| **Unit II** | **Validation:** Validation Controls, Server-Side Validation, Client-Side Validation, HTML5 Validation, Manual Validation, Validation with Regular Expressions<br>**Rich Controls:** Calendar Control, AdRotator Control, MultiView Control<br>**Themes and Master Pages:** How Themes Work, Applying a Simple Theme, Handling Theme Conflicts, Simple Master Page and Content Page, Connecting Master pages and Content Pages, Master Page with Multiple Content Regions, Master Pages and Relative Paths<br>**Website Navigation:** Site Maps, URL Mapping and Routing, SiteMapPath Control, TreeView Control, Menu Control | 15 L |
| **Unit III** | **ADO.NET:** Data Provider Model, Direct Data Access - Creating a Connection, Select Command, DataReader, Disconnected Data Access<br>**Data Binding:** Introduction, Single-Value Data Binding, Repeated-Value Data Binding, Data Source Controls – SqlDataSource<br>**Data Controls:** GridView, DetailsView, FormView | 15 L |

| | | |
|---|---|---|
| Unit IV | **Working with XML:** XML Classes – XMLTextWriter, XMLTextReader Caching: When to Use Caching, Output Caching, Data Caching<br>**LINQ:** Understanding LINQ, LINQ Basics, ASP.NET<br>**AJAX:** ScriptManager, Partial Refreshes, Progress Notification, Timed Refreshes | |
| | **Textbook(s):**<br>1) Beginning ASP.NET 4.5 in C#, Matthew MacDonald, Apress(2012)<br>**Additional References(s):**<br>1) The Complete Reference ASP .NET, MacDonald, Tata McGraw Hill<br>2) Beginning ASP.NET 4 in C# and VB Imar Spanajaars, WROX<br>**Links:**<br>1)  ASP.NET Tutorial<br>2)  http://dl.softgozar.com/Files/Ebook/Beginning_ASP.net_4.5.1_in_Csharp_and_VB_Softgozar.com.pdf | |

| Sr. No. | Practicals of   UGCSC403 |
|---|---|
| 1 | Write C# programs for understanding C# basics involving<br>a. Variables and Data Types        b. Object-Based Manipulation<br>c. Conditional Logic             d. Loops e. Methods |
| 2 | Write C# programs for Object oriented concepts of C# such as:<br>a. Program using classes                  b. Constructor and Function Overloading<br>c. Inheritance                               d. Namespaces |
| 3 | Design ASP.NET Pages with<br> a. Server controls.<br> b. Web controls and demonstrate the use of AutoPostBack<br> c. Rich Controls (Calendar / Ad Rotator) |
| 4 | Design ASP.NET Pages for State Management using<br>a. Cookies            b. Session State          c. Application State |
| 5 | Perform the following activities<br>a. Design ASP.NET page and perform validation using various Validation Controls b. Design an APS.NET master web page and use it other (at least 2-3) content pages.<br> c. Design ASP.NET Pages with various Navigation Controls |
| 6 | Performing ADO.NET data access in ASP.NET for<br>          a. Simple Data Binding                b. Repeated Value Data Binding |
| 7 | Design ASP.NET application for Interacting (Reading / Writing) with XML documents |
| 8 | Design ASP.NET Pages for Performance improvement using Caching |
| 9 | Design ASP.NET application to query a Database using LINQ |
| 10 | Design and use AJAX based ASP.NET pages. |

| Class: S.Y.B.Sc | Branch: Computer Science | Semester: IV |
|---|---|---|
| Subject: Web Programming-II | | |
| Period per Week(Each 48 min) | Lecture | -- |
| | Practical | 02 |

| | | Hours | Marks |
|---|---|---|---|
| Evaluation System | Semester End Exam | -- | |
| | Continuous Internal Assessment | | |
| | Semester End Practical Examination | 3 | 50 |
| | Total | __ | 50 |

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## UGCSSECP404 A Web Programming-II

**Course Outcomes:** After successful completion of this course, students will be able to:

**CO1:** Develop a static, interactive and well-formed webpage using JavaScript, CSS3 and HTML5.

**CO2:** Use PHP7 to improve accessibility of a web document.

**CO3:** Gain necessary skills for designing and developing web applications.

**ICT Tools Used:** Videos, PPT, Chalk Board

**Students Centric Methods:** Problem Solving and Participative
(Experimental, Participative, Problem Solving)

**Links: SWAYAM/MOOCS:**
1) https://nptel.ac.in/courses/106/108/106108227/
2) https://www.tutorialspoint.com/plsql/index.htm

## The CO-PO MappingMatrix

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| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | - | - | - | - | - | - | 3 | - | - | - | - |
| CO2 | 1 | - | - | - | - | - | - | 3 | - | - | - | 2 |
| CO3 | 1 | - | - | - | - | - | - | 3 | - | - | - | 3 |

| Course: UGCSSECP 404 A | Web Programming-II<br>(Credits : 3      Lectures/Week: 3) | Lectures |
|---|---|---|

| | | |
|---|---|---|
| **Unit I** | **XML:** Comparing XML with HTML, Advantages and Disadvantages of XML, Structure of an XML Document, XML Entity References, DTD, XSLT: XSLT Elements and Attributes xsl:template, xsl:apply-templates, xsl:import, xsl:call-template, xsl:include, xsl:element, xsl:attribute, e xsl:attribute-set, xsl:value-of<br>**AJAX:** AJAX Web Application Model, How AJAX Works, XMLHttpRequest Object – Properties and Methods, Handling asynchronous requests using AJAX | |
| **Unit II** | **PHP:** Variables and Operators, Program Flow, Arrays, Working with Files and Directories, Working with Databases, Working with Cookies, Sessions and Headers<br>**jQuery:** Fundamentals, Selectors, methods to access HTML attributes, meth<br><br><br>0ods for traversing, manipulators, events, effects | |
| **Unit III** | **Bootstrap:** -Introduction, Tables, Jumbotron, Alerts, Glyphicons, Pagination, Drop Down, Media Objects, Tool tip, Filters, job pills, Navbar<br>**Angular JS:** Introduction , Environment Setup, TypeScript, Components, Modules, Data Binding, Event Binding, Templeta, pipes, Routing, Services, CLI, Animations<br>**WordPress:** Introduction of WordPress, Templates | |
| | **Text books:**<br>   1. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed, Dreamtech Press<br>   2. Web Programming and Interactive Technologies, scriptDemics, StarEdu Solutions India<br>   3. PHP: A Beginners Guide, Vikram Vaswani, TMH<br>**Additional References:**<br>   1. HTML, XHTML, and CSS Bible Fifth Edition, Steven M. Schafer, WILEY<br>   2. Learn to Master HTML 5, scriptDemics, StarEdu Solutions Pvt Ltd<br>   3. Learning PHP, MySQL, JavaScript, CSS & HTML5, Robin Nixon, O'Reilly<br>4. PHP, MySQL, JavaScript & HTML5 All-in-one for Dummies, Steve Suehring, Janet Valade Wiley<br>**Links:**<br>   **1)** [https://www.tutorialspoint.com/html5/](https://www.tutorialspoint.com/html5/)<br>   **2)** https://www.w3schools.com/html/ | |

| Sr. No. | Practicals of   UGCSSECP404 A |
|---|---|
| 1 | Create a XML file with Internal / External DTD and display it using<br>   a. CSS     b. XSL |
| 2 | Design a webpage to handle asynchronous requests using AJAX on<br>   a. Mouseover    b. button click |
| 3 | Write PHP scripts for |

| | a. Retrieving data from HTML forms<br>b. Performing certain mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number<br>c. Working with Arrays<br>d. Working with Files (Reading / Writing) |
|---|---|
| 4 | Write PHP scripts for<br> a. Working with Databases (Storing Records / Reprieving Records and Display them) |
| 5 | Write PHP scripts for<br> a. Storing and Retrieving Cookies<br> b. Storing and Retrieving Sessions |
| 6 | Design a webpage with some jQuery animation effects |
| 7 | Develop a Registration form using Bootstrap |
| 8 | Design a webpage to implement simple Angular Js application. |
| 9 | Design a Login Form using Angular JS. |
| 10 | Using WordPress templates build a website. |

| **Class**: S.Y.B.Sc | **Branch**: Computer Science | | **Semester: IV** | |
|---|---|---|---|---|
| **Subject:** PL/SQL-II | | | |
| Period per Week(Each 48 min) | Lecture | | -- | |
| | Practical | | 02 | |
| | | | **Hours** | **Marks** |
| | **Semester End Exam** | | -- | |
| Evaluation System | **Continuous Internal Assessment** | | | |
| | **Semester End Practical Examination** | | 3 | 50 |
| | **Total** | | __ | 50 |

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## UGCSSECP404 A PL/SQL-II

**Course Outcomes:** After successful completion of this course, students will be able to:

**CO1:** Define the variables, constants, operators and data type of the database system.
**CO2:** Describe the structure of control statements.
**CO3:** Contract the stored procedures and Function in DBMS.
**CO4:** Apply Rollback and Commit operations on Database.

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| | |
|---|---|
| **ICT Tools Used:**Videos, PPT, Chalk Board | |

| |
|---|
| **Students Centric Methods:**Problem Solving and Participative (Experimental, Participative, Problem Solving) |
| **Links: SWAYAM/MOOCS**: 1)https://nptel.ac.in/courses/106/108/106108227/ 2)https://www.tutorialspoint.com/plsql/index.htm |
| **The CO-PO MappingMatrix** |

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3 | - | 1 | - | 1 | 1 | - | | - | - | - | - |
| CO2 | 3 | - | - | 1 | 1 | - | - | - | - | - | - | - |
| CO3 | - | - | - | 1 | 2 | 2 | - | - | - | - | - | - |
| CO4 | - | - | - | - | - | 2 | - | 2 | - | - | - | - |

| Course: UGCSSECP 404 B | PL/SQL - II <br> (Credits : 3      Lectures/Week: 3) | Lectures |
|---|---|---|
| **Unit I** | **Triggers:** Concept of triggers, Implementing triggers - creating triggers, Insert, delete, and update triggers, nested triggers, viewing, deleting and modifying triggers, and enforcing data integrity through triggers,Statement Level Triggers Versus Row Level Triggers, Create Instead of and Disabled Triggers. <br> **Sequences:** creating sequences, referencing, altering and dropping a sequence. <br> **Cursors :** Implicit Cursor,Explicit Cursor,Cursor Attributes,FOR Loop Cursor statement | |
| **Unit II** | **Exceptions:** Syntax,RaisingExceptions,User-definedExceptions, Predefined Exceptions <br> **Package:** Package Specification, Package Body, Referring Package Elements,Create Package in PL/SQL ,Forward Declarations,Cursors Usage in Package, Overloading, Dependency in Packages, Package Information**.** | |
| **Unit III** | **Collection:** Index-by tables or Associative array, Nested table, Variable-size array or Varray, Constructor and Initialization Concept in Collections, Collection Methods. <br> **Records:** Table-based records, Cursor-based records, User-defined records. <br> **Transaction:** Starting and Ending a Transaction, Committing a Transaction, Rolling Back Transactions,Automatic Transaction Control. | |

| Sr.No | Practical of UGCSSEC403 B |
|-------|---------------------------|
| 1 | Write a PL/SQL block for<br>a. Insert/Update/Delete Trigger<br>b. Before/After Trigger<br>c. Working with statement Level Trigger and Row Level Trigger.<br>d. Remove Trigger |
| 2 | Write a PL/SQL Block for Cursors<br>a. Cursor attributes:%ROWCOUNT,%FOUND,%NOTFOUND,%ISOPEN<br>b. Cursor with sub queries<br>c. Combination of PL/SQL, cursor and for loop<br>d. Parameterized cursors, Cursor Variables |
| 3 | Write a PL/SQL Block for Exception Handling<br>a. Exception Types (implicitly raised, Explicitly raised)<br>b. Trapping Exceptions (WHEN exception1, WHEN OTHERS)<br>c. Predefined Exception<br>– NO_DATA_FOUND<br>– TOO_MANY_ROWS<br>– INVALID_CURSOR<br>– ZERO_DIVIDE<br>– DUP_VAL_ON_INDEX |
| 4 | Write a PL/SQL Block for Package. |
| 5 | Write a PL/SQL Block for<br>a. Declare and use Association Array<br>b. Varray<br>c. Nested Tables |
| 6 | Write a PL/SQL Block to demonstrate the execution of a transaction,Savepoint and Rollback. |

| Class: S.Y.B.Sc | Branch: Computer Science | Semester: IV |
|-----------------|--------------------------|--------------|
| Subject: Android Developer Fundamentals | | |
| Period per Week(Each 48 min) | Lecture | 04 |

| | Practical | | 02 | |
|---|---|---|---|---|
| | | **Hours** | **Marks** | |
| | **Semester End Exam** | 2 hrs | 60 | |
| Evaluation System | **Continuous Internal Assessment** | — | 40 | |
| | **Semester End Practical Examination** | — | — | |
| | **Total** | ___ | 100 | |

**UGCSGE405 A Android Developer Fundamentals**

**Course Outcomes:** After successful completion of this course, students will be able to:

**CO1:** Recognize the requirements of the Mobile programming environment.

**CO2:** Design and configure Android application development tools ,basic methods and techniques for developing Apps.

**CO3:** Practice App development on Android Platform and Connect database with App.

**CO4:** Develop working prototypes of working systems for various uses in daily lives.

**ICT Tools Used:** Videos, PPT, Android Studio

**Students Centric Methods:** Practical, Group Project
(Experimental, Participative)

**Links: SWAYAM/MOOCS:**
1) https://www.coursera.org/specializations/android-app-development
2) https://onlinecourses.swayam2.ac.in/nou21_ge41/preview

**The CO-PO MappingMatrix**

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 1 | - | - | - | 2 | - | - | 3 | - | - | - | 1 |
| **CO2** | 1 | - | - | - | 2 | 3 | - | 3 | - | - | - | - |
| **CO3** | - | - | - | - | 2 | - | - | 3 | - | - | - | 2 |
| **CO4** | 1 | 1 | - | - | 1 | - | - | 3 | - | - | - | 1 |

| Course: UGCSGE 405 A | **Android Developer Fundamentals** **(Credits : 3      Lectures/Week: 4)** | **Lectures** |
|---|---|---|

| | | |
|---|---|---|
| **Unit I** | **The Android Platform:** Introduction to the Android platform, Architecture, Android components, Development Tools – SDK, ADB, Gradle, etc. Installing Android Studio IDE, and developing first app **Activities and Lifecycle, Fragments and Intents -** Working with Activities-creating activity, starting activity, managing life cycle of activity, applying themes and styles, displaying dialog in activity; Using Intents-exploring intent objects, resolution, filters passing data using objects in intents; Fragments, Intent Object to Invoke Built-in Application | **12 L** |
| **Unit II** | **UI Design:** Display Orientation, Views and ViewGroups, Layouts, Action Bars and Navigation Drawers, Android Layout Managers - LinearLayout, RelativeLayout, ScrollView, TableLayout, FrameLayout, Action Bar, **Working with Views**- TextView, EditText View, Button View, RadioButton View, CheckBox View, ImageButton View, ToggleButton View, RatingBar View, ProgressBar View, AutoCompleteTextView, TimePicker View, DatePicker View, ListView View, Spinner View, ImageView, WebView | **12 L** |
| **Unit III** | **Networking in Android:** Accessing the network, Permission to access the network, Checking Network Availability, Sending Email, consuming web services using HTTP **Location-Based Services -** Displaying Maps, Getting Location Data, monitoring a Location, Google Maps API, Using the Geocoder. | **12 L** |
| **Unit-IV** | Screen Navigation, RecyclerView, Drawables, Themes and Styles, Material design, Providing resources for adaptive layouts, AsyncTask and AsyncTaskLoader, Connecting to the Internet, Broadcast receivers, Services, Notifications, Alarm managers | **12 L** |
| **Unit-V** | **Data** - saving, retrieving, and loading: Overview to storing data, Shared preferences, SQLite primer, store data using SQLite database, ContentProviders, loaders to load and display data, Permissions, performance and security, Firebase and AdMob, Publish your app | **12 L** |
| | **Textbook(s):** 1) "Beginning Android 4 Application Development", Wei-Meng Lee, March 2012, WROX. **Additional References(s):** 1)https://developers.google.com/training/courses/android-fundamentals 2)https://www.gitbook.com/book/google-developer-training/android-develo per-fundamentals-c ourse-practicals/details **Links:** 1) http://www.kmvportal.co.in/Course/MAD/Android%20Book.pdf | |

| Sr. No. | **Problems  of** UGCSGE 405 A |
|---|---|

| 1 | Install Android Studio and Run Hello World Program. |
|---|---|
| 2 | Create an android app that demonstrates Activity Lifecycle and Instance State. |
| 3 | Create an android app with Interactive User Interface using Layouts. |
| 4 | Create an android app that demonstrates working with TextView Elements. |
| 5 | Create an android app that demonstrates the use of Keyboards, Input Controls, Alerts, and Pickers. |
| 6 | Develop an application for working with location based services. |
| 7 | Create an android app that demonstrates Screen Navigation Using the App Bar and Tabs. |
| 8 | Create an android app to Connect to the Internet and use Broadcast Receiver. |
| 9 | Create an android app to show Notifications and Alarm manager. |
| 10 | Create an android app to save user data in a database and use of different queries. |

| Class: S.Y.B.Sc | Branch: Computer Science | Semester: III | |
|---|---|---|---|
| **Subject: Combinatorics & Graph Theory** | | | |
| Period per Week(Each 48 min) | Lecture | 04 | |
| | Practical | 02 | |
| Evaluation System | | **Hours** | **Marks** |
| | **Semester End Examination** | 2 hrs | 60 |
| | **Continuous Internal Assessment** | — | 40 |
| | **Semester End Practical Examination** | - | - |
| | **Total** | — | 100 |

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### UGCSGE405B Combinatorics and Graph Theory

**Course Outcomes:** After successful completion of this course, students will be able to:

**CO1:** Analyze the applications of combinatorics & its uses & Problems , Mathematical Induction.

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**CO2:** Summarize the concepts of graphs & its different types.
**CO3:** Select different algorithms to find shortest path & minimal spanning tree.
**CO4:** Define the terminology of network flow & discuss the Combinatorial Applications of Network Flows

**ICT Tools Used:** Videos, PPT, Chalk Board

**Students Centric Methods:** Problem Solving and Participative
(Experimental, Participative, Problem Solving)

**Links: SWAYAM/MOOCS:**
1) https://nptel.ac.in/courses/106/108/106108051/
2) https://nptel.ac.in/courses/111/106/111106102/
3) https://nptel.ac.in/courses/106/108/106108054/

**The CO-PO MappingMatrix**

| CO\PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 2 | - | 1 | 2 | 1 | - | - | - | - | - | - | - |
| CO2 | 3 | - | 1 | 1 | 1 | - | - | - | - | - | - | - |
| CO3 | - | - | 1 | 3 | 1 | - | - | - | - | - | - | - |
| CO4 | 1 | - | 1 | 2 | 1 | - | - | - | - | - | - | - |

| Course:<br>UGCSGE 405 B | **Combinatorics & Graph Theory**<br>(Credits : 3     Lectures/Week: 4) | **Lectures** |
|---|---|---|
| **Unit I** | **Introduction to Combinatorics:** Enumeration, Combinatorics and Graph Theory/ Number Theory/Geometry and Optimization, Sudoku Puzzles. Strings, Sets, and Binomial Coefficients:<br>**Strings-** A First Look, Combinations, Combinatorial, The Ubiquitous Nature of Binomial Coefficients, The Binomial, Multinomial Coefficients<br>**Induction:** Introduction, The Positive Integers are Well Ordered, The Meaning of Statements, Binomial Coefficients Revisited, Solving Combinatorial Problems Recursively, Mathematical Induction, and Inductive Definitions Proofs by Induction. Strong Induction | **12 L** |
| **Unit II** | **Graph Theory:** Basic Notation and Terminology of graphs,Walk,Trail,Path,Cycle,Distance between two Pair of Vertices,degree of graph ,Eccentricity of Vertex,Centre & Radius of Graph,Diameter of the graph. Multigraphs: Loops and Multiple Edges, Connected graph, Component,Bridge,Cut set ,Cut Vertex, Edge & Vertex Connectivity, Minimal Degree of graph,Weighted Graph, Isomorphism of graphs, Eulerian and Hamiltonian Graphs, Graph Coloring, Planar Graphs,Clique. Dijikstra's Algorithm | **12 L** |

| | | |
|---|---|---|
| | **Applying Probability to Combinatorics,** Small Ramsey Numbers, Estimating Ramsey Numbers, Applying Probability to Ramsey Theory, Ramsey's Theorem The Probabilistic Method | |
| **Unit III** | **Tree :** Basic Notation and Terminology of tree,Eccentricity of Vertex,Centre & Radius of Tree ,Diameter of the Tree, Spanning Tree,Shortest Spanning Tree,Krushkal's Algorithm,Prim's Algorithm, Counting Labeled Trees,Prufer Code. | **12 L** |
| **Unit IV** | **Network Flows:** Basic Notation and Terminology, Flows and Cuts, Augmenting Paths, The Ford-Fulkerson Labeling Algorithm, A Concrete Example ,Integer Solutions of Linear Programming Problems.Introduction of Transportation Problem | **12 L** |
| **Unit V** | **Combinatorial Applications of Network Flows**: Introduction. Matching in Bipartite Graphs, Poset, Chain partitioning,Permutation group, Pólya's Enumeration Theorem: Coloring the Vertices of a Square | **12 L** |
| | **Textbook**(s): <br> 1) Applied Combinatorics, Mitchel T. Keller and William T. Trotter, 2016, http://www.rellek.net/appcomb. <br> **Additional Reference(s):** <br> 1) Applied Combinatorics, sixth.edition, Alan Tucker, Wiley; (2016) <br> 2) Graph Theory and Combinatorics, Ralph P. Grimaldi, Pearson Education; Fifth edition (2012) <br> 3) Combinatorics and Graph Theory, John Harris, Jeffry L. Hirst, Springer( 2010). <br> 4) Graph Theory: Modeling, Applications and Algorithms, Agnarsson, Pearson Education India (2008). <br> **Links:** <br><br> 1) http://www.rellek.net/appcomb. <br> 2) http://www.noahc.me/Applied%20Combinatorics%206th%20edition.pdf <br> 3) https://www.geeksforgeeks.org/transportation-problem-set-1-introduction/#:~:text=Transportation%20problem%20is%20a%20special,cost%20of%20transportation%20is%20minimized. <br> 4) http://web.mit.edu/15.053/www/AMP-Chapter-08.pdf | |

| Sr. No. | Practicals of   UGCSGEP405 B |
|---|---|
| 1 | Solving problems on strings, sets and binomial coefficients. |
| 2 | Solving problems using induction. |
| 3 | Solving problems on Eulerian and Hamiltonian graphs |
| 4 | Solving problems on Chromatic number and coloring |
| 5 | Solving problems using Kruskal's Algorithm |

| 6  | Solving problems using Prim's Algorithm |
|----|------------------------------------------|
| 7  | Solving problems using Dijkstra's Algorithm |
| 8  | Solving problems of finding augmenting paths in network flows. |
| 9  | Solving problems on network flows using Ford-Fulkerson Labeling Algorithm |
| 10 | Solving problems on posets and their associated networks |